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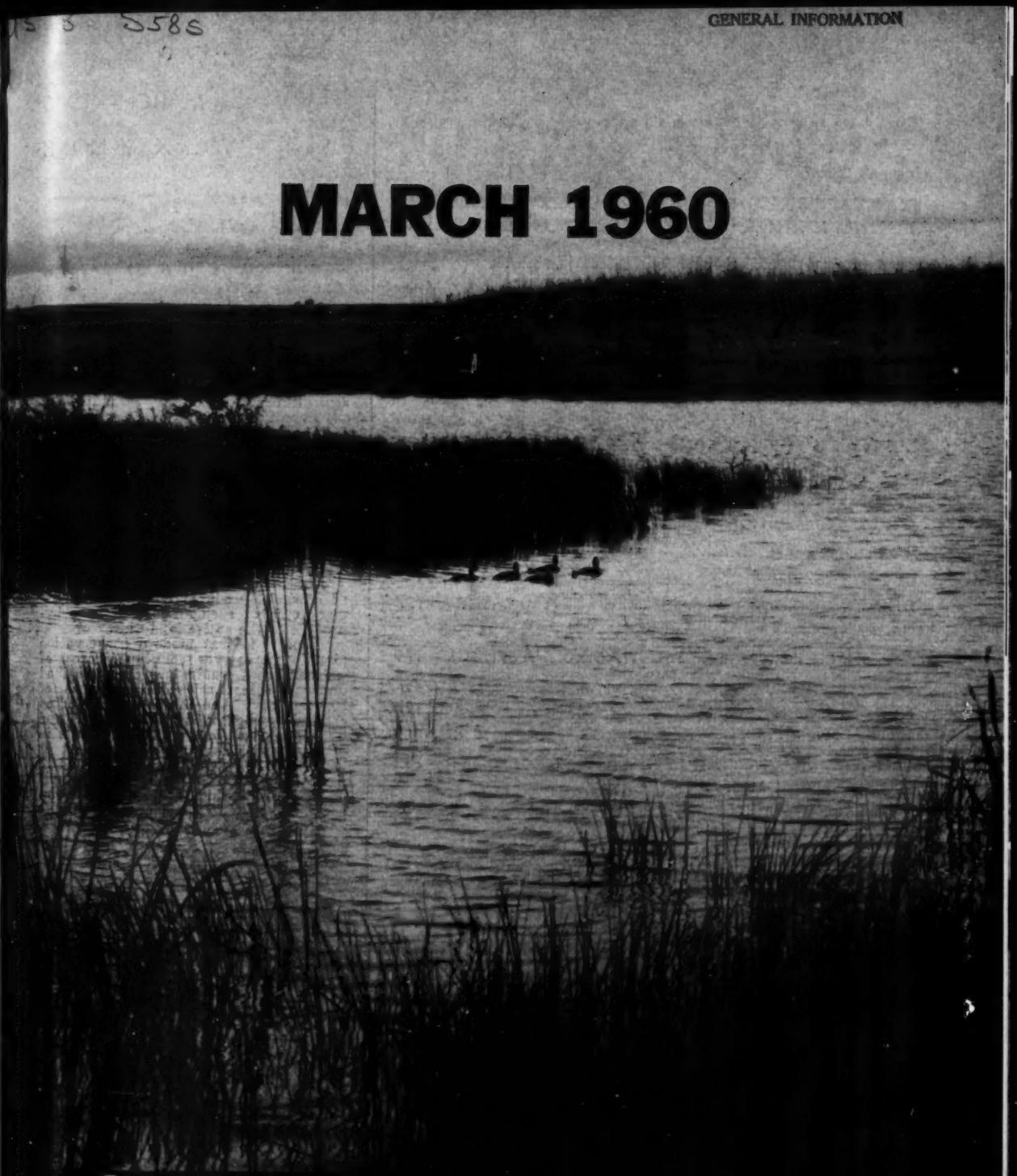

SOIL CONSERVATION

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SOIL CONSERVATION

MARCH—1960

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ADMINISTRATOR, SOIL CONSERVATION SERVICE

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U. S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D. C.

★ THIS MONTH ★

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TOM DALE, Editor

SOIL CONSERVATION is published by direction of the Secretary of Agriculture as administrative information required for proper transaction of the public business. The printing of this publication has been approved by the Bureau of the Budget, June 26, 1958. SOIL CONSERVATION supplies information for workers of the Department of Agriculture and others engaged in soil conservation.

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SCIENTIFIC LAND USE HELPS PRESERVE AND CREATE WILDLIFE HABITAT.—"Agriculture is not necessarily inimical to wildlife. It is true that agriculture does displace some wildlife by altering its habitat. At the same time, agriculture creates new habitats—for the same kinds of wildlife at other locations, or for other kinds of wildlife whose requirements are better served by an agricultural landscape. As a result, there is probably more wildlife today than when our forefathers first saw this land.

"A land-use pattern that respects the natural capabilities of the land, of a necessity includes a place for wildlife. Some land, uniquely suited to wildlife, is permanently dedicated to that use. The farm or ranch, planned and managed as a whole, produces wildlife as a primary crop of such areas, and as a by-product of the entire land unit.

"Thus it is that modern conservation planning preserves countless acres of wetlands that would have been drained under the less scientific programs of 30 years ago. And the new water areas created by thousands of farm ponds and by hundreds of larger impoundments in watershed projects replace—in part at least—the wet areas that must yield to agricultural use. This is but one example of the way in which soil and water conservation preserves and creates wildlife habitat."

—D. A. WILLIAMS

FRONT COVER.—Dugout and dam on an SCD cooperator's farm in Miner county, South Dakota, that provide stockwater and a nesting pace for waterfowl.

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Cooperative efforts create—

A New Waterfowl Refuge

By Peter W. Taylor

THE Market Lake area near Roberts in southeastern Idaho promises to be one of the best waterfowl refuges in the West, due largely to the determined efforts of one sportsman and the cooperation he obtained from his neighbors and local, State, and Federal agencies.

Back in 1954, Ira Gabrielson, President of the Wildlife Management Institute, was touring the Market Lake area with Eddie Pederson, chairman of the Bonneville County Sportsmen's Association.

"Market Lake is one of the best potential waterfowl refuges left in the West," commented Gabrielson. "If this area is allowed to fall into private ownership, public hunting in Idaho will receive a severe setback."

From that day on, Pederson pursued a campaign to have the Market Lake area purchased by the Idaho Fish and Game Department as a waterfowl refuge. And his campaign has been successful.

"The job of convincing the biologists was easy," Pederson recalls. "Convincing the local people and the State land board was something else."

The local people were organizing to stop the State purchase because they thought this would cause serious duck depredations, more trouble with hunters, loss of valuable grazing land, and would increase the already-serious drainage problems.

It was generally agreed that the solution to the problem was to work through the West Side Soil Conservation District. After much discussion the West Side district supervisors decided to call a meeting. All local people were invited and a number of outside people interested in the area were welcomed.

The night of the meeting the Roberts Grange Hall was packed. Kenneth Anderson, chairman of the local Rod and Gun Club, acted as moderator. Representatives of the State Fish and Game Department explained their plans for development. The local leaders then were given a chance for rebuttal. Arguments were strong and bitter. In addition, it was brought

Note:—The author is area conservationist, Soil Conservation Service, Idaho Falls, Ida.

Waterfowl on the Market Lake refuge near Roberts, Idaho.

out that a Salt Lake City group wished to purchase the area to develop it privately. Some felt that under private management there would be less depredation. The situation was deadlocked.

It was at this stage that Anderson called upon a representative of the Soil Conservation Service to explain why this land was best suited for use as a waterfowl refuge and tell the things that might be done to resolve the problems of depredation and drainage.

An explanation of land capabilities was given, showing that much of the area was Class VIII land because of marsh; further, that almost all the rest was Class V or VII and, with proper management, could continue to be used for grazing by lease from the State.

Then the State Fish and Game Department agreed to enter into an agreement with the West Side district for planning, development, and control of the area. Thus, SCS technicians would assist the game department in preparing a complete plan for development of the farmable areas of the proposed refuge, and provide soils information on all areas to be flooded. It was agreed that areas were not to be flooded if soils were highly permeable at the surface or if the floodwater backed up on any sand dunes.

It was agreed that a series of water table stations would be established on adjacent private lands. These would be read at monthly intervals to determine if the flooding was causing an increase in the surrounding drainage problems. If the water table was rising, then the State Fish and Game Department would assist the local people in a water control program that would alleviate this situation. It was further agreed that, insofar as feasible, all drainage water would be pumped into the Butte Market Lake Canal system and made available for irrigation purposes.

With these assurances, sentiment changed; and when a vote was taken only a few were in opposition. The news was relayed back through State land board channels and the new refuge became a fact.

Immediately after the purchase of the Market Lake refuge a cooperative agreement between the West Side Soil Conservation District and the Idaho State Fish and Game Department was signed. Following this SCS technicians and the Fish and Game Department people started a development plan.

The first job was making a detailed soil survey of the entire refuge. This completed, a topographic survey of all farmable land was made to permit design of the irrigation system, field layout, and land leveling. A detailed engineering survey was made of the old roadside drainage and irrigation supply ditch to facilitate obtaining sufficient water for irrigation. Piezometer sites were selected and holes bored for subsurface water readings in the surrounding area.

A crop rotation system was planned and established on the farm areas. Controlled grazing was planned for suitable areas. Insufficient funds have made it impossible for the Fish and Game Department to establish the system of water-impounding areas, but these are set up for future establishment.

The old irrigation system now has been completely revised and most of the farmland leveled for good irrigation. Cereal grains, peas, and other legumes are being produced for wildlife food. The main water supply system has been revamped to supply needed irrigation water and surveys for additional water supply ditches have been completed.

A drive through the area in the early spring, when thousands of pintail, mallard, geese, and swan stop here on their way north, gives concrete evidence of the soundness of the refuge. Another trip in the fall when hundreds of scattergunners are enjoying the open shooting of both ducks and pheasants gives conclusive proof that the future of the area is good and can get better with further development.

◆

A conservation farm or ranch plan is not merely a format. It is the image on paper of the farmer's or rancher's idea of soil and water management that he wants to use, once he has sound technical information and understanding of his land's needs.

◆

Being up in the air as flight engineer for a commercial airline enabled Harry Proctor, Jr., to see the land and its condition. So he got down to earth in developing a conservation plan for his 250-acre farm near Kansas City, Mo. in cooperation with the Clay County Soil Conservation District.

The Prairie Chicken Booms Again

By W. H. Lathrop

"THE boom-boom-b-o-o-m of the prairie chicken, once nearly extinct in Illinois, is rolling out again over the meadows, grassed waterways, and contoured fields in Marion County."

That's from a story by Bob Basinger, SCS soil conservationist for the Marion Soil Conservation District. It might sound a bit rhetorical except for the farmers' names and locations Bob tells about—and except for the clear photo of a prairie chicken on its nest that headed the front-page story in the *Salem Times Commoner*.

It's the kind of photo that most of us just dream about. It could be obtained only by a man who fails to recognize that certain things are supposed to be impossible.

Both the farmer and his hired man appreciate wildlife and keep a sharp lookout when plowing or mowing to avoid destroying nests, Bob's story relates. The farmer had noticed the prairie chicken flying up and had marked the location of the nest with a stake.

Bob felt fortunate to get within five feet where he could see the hen's eyes and beak down in the thick grass. Here he took what photographers call a "safety picture."

Then he inched forward, avoiding any sudden motion. Finally the hen was pecking at his fingers as he parted the thick grass and snapped a photo with the camera about 20 inches from the chicken.

Prairie chicken on nest.

Note:—The author is information specialist, Soil Conservation Service, Milwaukee, Wis.

Tickclover— for Quail and Livestock

By Karl E. Graetz

ALL of the tickclovers, sometimes called "beggarweeds" or "beggarticks," are recognized as choice foods for bobwhites. In the colonial period, land clearing and burning were judged to be responsible, in part, for an increase of beggarweeds and other leguminous weeds. This contributed to a significantly larger quail population than has been present since that time. Early recent efforts at using tickclovers for wildlife consisted primarily in trying to manage existing stands through the use of fire.

As early as 1937, Soil Conservation Service nurseries began the evaluation of tickclovers.

Note:—The author is plant materials specialist, Soil Conservation Service, Raleigh, N. C.

These attempts dealt with many of the species, but they were not carried to conclusion because of the appearance of *Lespedeza bicolor*, which was at that time easier to manage. After *Lespedeza bicolor* had become established as a manageable quail food plant, other plants were sought to complement its use. Service technicians again turned to the tickclovers as the most probable group.

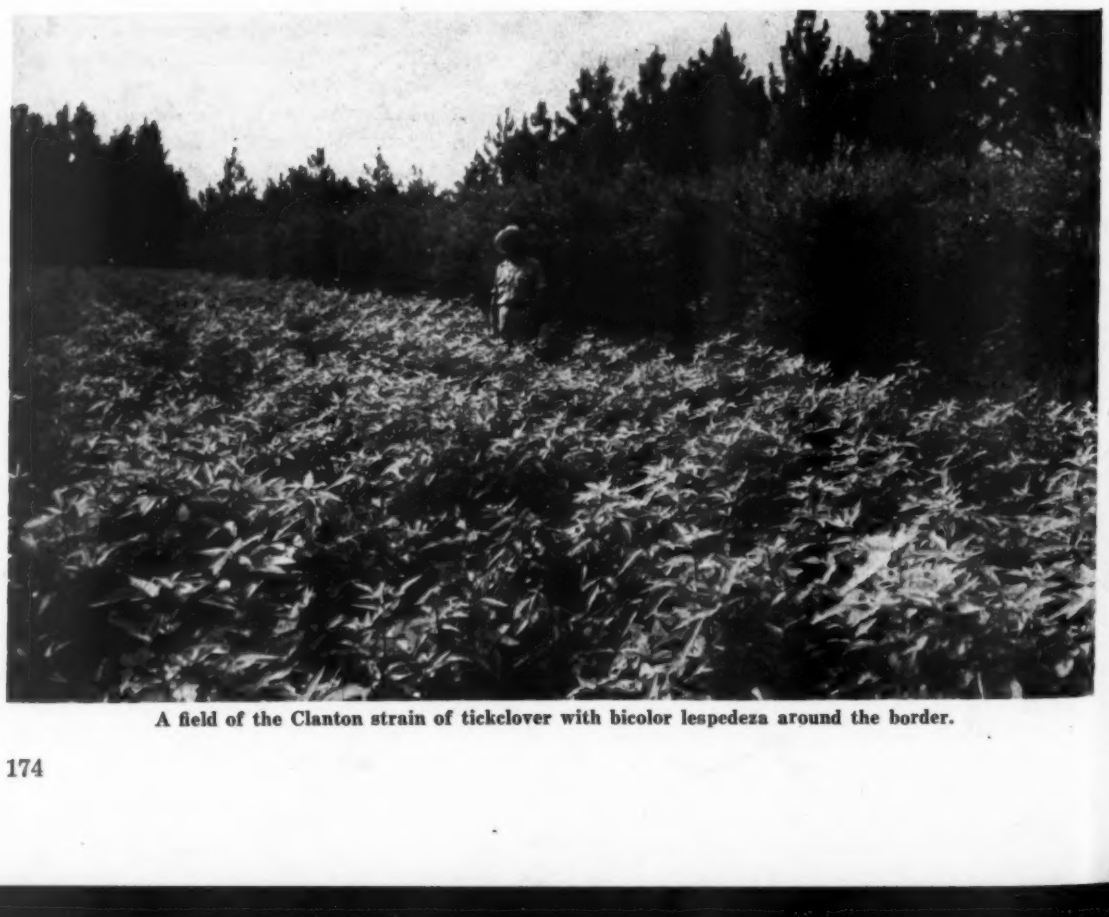
In 1947 a strain of *Desmodium perplexum* (formerly called *D. Dillenii*) was picked up near Clanton, Ala., and tested. Its leafy quality and good seeding habits showed promise for wildlife as well as forage use. This material was increased at the Thorsby, Ala., nursery in 1950-51 and distributed to other nurseries in the southeast. In 1953, initial evaluations of this plant at an SCS nursery confirmed its potential value. From 1954 through 1957 observations were continued that proved the superior qualities of the plant.

The first sizable increase block was planted in the spring of 1957. It has recently been named the Clanton strain. The first field plantings were established in 1958. This is the first known instance of using this species as a domestic plant.

In general terms, this plant is a perennial, upright, native legume. Specifically, the Clanton strain of tickclover is more leafy, taller, and matures later than other native selections being studied. In 1958, a seed crop was successfully combined near Chapel Hill, N.C., on November 18. It was found that harvesting must wait until the seeds are hard and the pods and stems brown and dry.

An encouraging aspect of this strain is that it probably has a double use. Not only is the seed taken readily by quail, but the plants make good hay if mowed when 16 to 20 inches high. Thus, for example, a farmer could mow part of his field for hay and leave unmowed strips along field borders for quail food. It is even possible to mow the tickclover once in May and still produce an abundant seed crop in the fall.

For forage production, the plant is adapted to most of the southeast with the possible exception of peninsular Florida. Because of late seed maturity, it may not be useful for quail food in the Appalachian Mountains or in other



A field of the Clanton strain of tickclover with bicolor lespedeza around the border.

areas which normally expect frost in late September or early October.

The plant requires moderately well-drained soils with average fertility. It does not do well on highly eroded or deep sand soils, although it can be grown on such sites with adequate fertilization.

In nature, the tickclovers are widely scattered. Except for the annual Florida beggarweed, *Desmodium tortuosum*, they rarely occur in large colonies or pure stands. There has been some doubt that the native tickclovers could be "tamed" or successfully managed as cultivated crops. The Clanton strain seems to have broken through this barrier. Field plantings of this selection show that complete stands can be easily established and managed as a perennial quail food, and that large quantities of seed can be produced on limited areas.

In 1958 successful plantings were established in Johnston, Cleveland, Wake, and Orange Counties, North Carolina. All were planted in 3-foot rows. Hunters found quail in these plantings with frequent regularity. The craws of the quail taken were crammed with tickclover seed. Quail began to use these food blocks early in the fall, and heavy use continued through the winter. Thus, this plant may become an important addition to the shrub lespedezas, such as *Lespedeza bicolor* and *Lespedeza japonica*, which seem to get heaviest use later in the winter.

Seed yield measurements were taken last fall in the Johnston County planting, which was then two years old. The planting is on Norfolk sandy loam. No fertilizer was applied the second year. The plants were uniform in height to about 40 inches, and they formed a complete canopy. A square measuring 10′ by 10′ was carefully harvested. It yielded 1.57 lbs., or about 684 lbs. per acre.

Plantings are easily established from seed. The plant withstands weed competition well. Row plantings which are fertilized and cultivated at least once are best. Broadcast plantings often take an extra year to become established. Usually they must be clipped high one time to set back tall-growing weeds. Ragweed seems to be the worst competitor.

The tickclovers are occasionally mentioned in the literature as possible subjects for forage investigations. Some species of tickclover have had limited use for forage production in other countries. They have not received serious attention of agronomists in this country. In 1956 the author noted a native perennial species as an invader in some of the mountain meadows in North Carolina. The farmers were mowing it as an incidental in their production of orchardgrass and fescue hay. It contributed sizable quantities of palatable hay in second and third cuttings. The significance of this fact was generally being overlooked by the farmers.

The possibility of planting tickclover "on purpose" instead of using it "by accident" encouraged us to establish the first field planting for hay or silage in Cherokee County, N. C., in the spring of 1959. The Clanton strain was used, since seed of it had just become available. The cooperator, W. D. McCombs, took a first cutting of hay on July 15th. This turned out 47 bales of hay per acre, which weighed an estimated 3,500 lbs. A second cutting on September 1st, after a long dry period, yielded 22 bales per acre. Mr. McCombs was pleased with the quality of the hay. His cattle found it palatable. This first year performance of seedling plants was creditable. We should expect it to do even better in following years.

Two samples of Clanton tickclover hay were analyzed at North Carolina State College and found to contain about 18 percent protein, 6 percent ash, 3 percent fat, and 42 percent nitrogen-free extract, with only 23 percent fiber. This analysis indicates a high nutritive value, comparable to alfalfa. Its soil and site requirements are less restrictive than for alfalfa. It can be grown in the deep south and the Coastal Plain areas where alfalfa is not entirely at home.

A research project on this plant has been set up with the North Carolina Experiment Station. Plot plantings have been designed to give information on broadcast versus row plantings, effect of 0, 1, 2, and 3 cuttings a year, yields, and other incidental evaluations.

Seed of the Clanton strain of tickclover is not available on the commercial market. Limited quantities are available through the Plant Materials Centers of the Soil Conservation Service.

There is still much to learn about this plant. Our work so far indicates that it has a good chance of becoming a new and useful crop for the Southeast.

More and better food crops bring

More Geese and Ducks

to their winter refuge.

By J. B. Earle

MORE than 8,000 wild geese are now wintering on the Santee Wildlife Refuge near Summerton, S. C., where only 50 geese were found 7 years ago. Also, an estimated 35,000 ducks visit this refuge each year, whereas only a few thousand could be counted a few years ago. The phenomenal increases in the number of waterfowl are due mainly to the systematic increase in the food supply that was brought about by the refuge managers.

The waterfowl food crops are grown according to a definite plan that was worked out by the refuge managers and SCS technicians. The cropping plan is designed not only to increase the food supply for geese and ducks, but also to conserve and rebuild the productivity of the soil.

Wind erosion has always been a problem on the light sandy soils of the refuge, where there are large open spaces of land and water and strong winds during the winter and spring. Since the wild geese won't feed near hedgerows, the hedges that formerly helped protect the land against the force of winds were removed. This increased the wind erosion hazards.

Field-stripping for wind erosion control was tried, but was discontinued because more intensive use of the land, double-cropping, was necessary to provide enough food for the increasing number of geese. Mulch farming has been instituted instead, and seems to provide a satisfactory solution for the wind erosion problem.

Small grains, corn, soybeans, and crotalaria are the principal crops grown on the refuge. Small grain, mainly wheat, is planted on the 250 acres of open land each fall. It is used primarily for grazing by geese during the winter. After the geese leave in the early spring, a large part of the area is planted to corn or crotalaria. The corn and crotalaria are planted, separately, in the growing grain without any seedbed preparation. The growing grain gives adequate ground cover against wind erosion until the main blowing season has passed; then it is gradually worked into the soil during the process of cultivation. Since the geese will not eat the corn unless the stalks are chopped down, this is done each fall with a rotary mower.

A part of the small grain is allowed to

Note:—The author is assistant State conservationist, Soil Conservation Service, Columbia, S. C.

Stripcropping with small grain and cultivated crops formerly was used to control wind erosion on the Santee wildlife refuge.

Planting soybeans in small grain stubble on the Santee wildlife refuge.

Corn that was planted in growing wheat on the Santee wildlife refuge.

mature, and produces seed for planting the next year's crop. After this grain is combined, soybeans are planted in the stubble, without prior seedbed preparation. Only a small part of the soybeans are harvested in the fall—just enough to provide seed for the next year's plantings. The remainder is left for geese and duck food.

The corn produces well under this system of management, except during extremely dry years. Refuge manager Gerald F. Baker and his assistant, William A. Reid, are working with SCS technicians in designing a sprinkler system for supplemental irrigation. The water supply is plentiful, of course, on this refuge.

Over the years, the cropping system and residue management practices have helped build up the organic matter and fertility of the soil. Yields of both corn and small grains are increasing and wind erosion had ceased to be a serious problem.

Managers of this refuge have cooperated with the Clarendon Soil Conservation District for many years. They are not only doing a good job of wildlife conservation but they are also making wise use of soil and water. Their main objective is to provide for migratory waterfowl, especially geese. But they don't stop there. They are well-rounded conservationists.

No hunting is permitted on the refuge. Sightseeing is by request. This is an interesting sight in the late fall when thousands of geese and ducks return again to their wonderful winter home.

Drilling crotalaria in growing wheat on the Santee wildlife refuge.

Wildlife Sanctuary in a Suburban Development

By Lester Fox

BOTH wildlife and the public benefit from an Audubon sanctuary under development in a once-rural part of Connecticut that has given way to suburban homes, super markets, and turnpikes.

Note:—The author is information specialist, Soil Conservation Service, Upper Darby, Pa.

SCS technician checks a pond outlet that permits the raising or lowering of water level.

The new sanctuary, curiously enough, resulted from the rapid changes that are annually converting a million acres of our best farmland to other uses. The Audubon Society of Connecticut had a wildlife refuge near Westport. The Connecticut Turnpike swallowed it. The Society, of course, was paid for its land. But it ended up with a handful of cash and no sanctuary.

One of the ponds on the Audubon Society wildlife sanctuary near Greenfield Hill, Conn.

Mr. and Mrs. Roy E. Larsen gave 40 acres of their land near Greenfield Hill to the Society for a new refuge. The Larsens' aim was to preserve a wildlife area for public benefit in a region rapidly becoming population-saturated.

The Society entered into an agreement with the Fairfield County Soil Conservation District to apply all the conservation measures that the land needed as a wildlife sanctuary. SCS technicians helped work out a conservation plan with Society President J. Reid Williamson of Fairfield. Work started on the land in May 1959. Philip Barske, an executive committee member and a Wildlife Management Institute employee, supervised the work.

Workers cut random trails through the sanctuary. They burned some of the removed brush and piled the rest on the ground as cover for birds, rabbits, and other animals. They opened parts of the natural wooded areas to stimulate grass and shrub growth, thus providing the mixture of cover types important to wildlife.

Parts of the sanctuary are planted to millet, sorghum, buckwheat, sudangrass, and other vegetation that supplies food and cover for wildlife. The conservation plan also calls for planting honeysuckle, multiflora rose, and hemlock, spruce, and pine trees.

Using SCS specifications, the Society built two ponds and developed a swamp and a marsh. The ponds contain flashboards in an outlet so that the water level can be raised or lowered. The water is kept shallow during the summer. That lets the planted Japanese millet, smartweed, switchgrass, and other food plants grow. In September, pond depth is raised to three feet. The water is kept at that level for the benefit of acquatic birds until the following June, when it is lowered again. Nesting boxes at the ponds invite wood ducks.

Mallard ducks are among the wildlife already using the sanctuary. While the refuge was far from complete, they raised two broods in one pond area. Muskrats also are present in considerable numbers. Songbirds are abundant throughout the sanctuary.

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About 28 million acres of former cropland will be held out of production in 1960 under the conservation reserve program of the Soil Bank.

Wildlife Conservation in South Carolina Schools

By J. B. Earle

WILDLIFE conservation is gaining more and more attention in science fairs and in units of instruction in South Carolina schools. These children are learning that one of the best routes to more wildlife is through soil and water conservation. They are learning that wildlife grown on farms and ranches provide most of our hunting, and that much of our fishing is also affected by the way farmers and ranchers manage their land. So, they are beginning to appreciate the fact that farmers and ranchers are the key to abundant wildlife.

They are finding out that the Soil Conservation Service, as part of its assistance to soil conservation districts and watershed projects, helps individual land operators apply many soil and water conservation practices that increase wildlife.

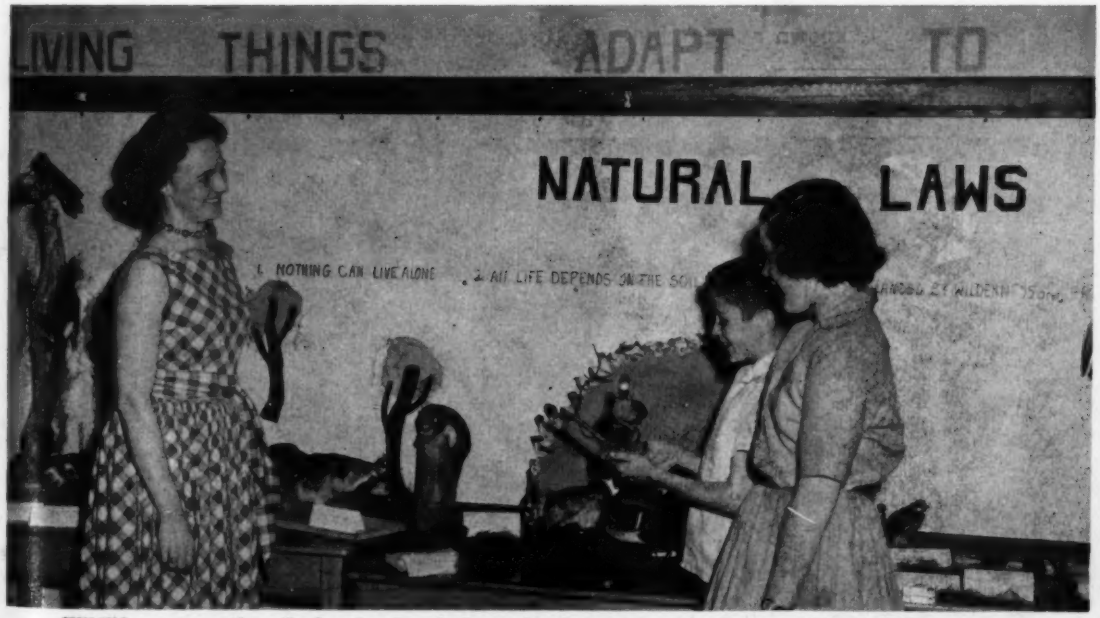
Note:—The author is assistant State conservationist, Soil Conservation Service, Columbia, S. C.

For example, farmers cooperating with the 45 soil conservation districts in South Carolina have built more than 20,000 ponds. Agricultural Conservation Program cost-sharing helped with many of these. Fish for many of the ponds were provided by the U. S. Fish and Wildlife Service.

Also, SCS has helped farmers in South Carolina with more than 30,000 acres of marsh improvement for wildlife. And bicolor lespedeza for quail food has been planted on thousands of acres. Most of these plants were provided by the South Carolina Wildlife Resources Department.

There is much for school children to learn about wildlife conservation because there is considerable activity in this field. Once they come to fully appreciate that wildlife is a crop of the land they will have laid a good foundation on which to develop sound attitudes about conservation of wildlife.

By learning about our resources and the care we must give them, our young people will see that a good share of the world's troubles stem directly from our past failures to learn to live with the land, instead of against it.



Wildlife conservation display in the sixth grade classroom at the Brennan School, Columbia, S. C.

A Better Home For—

Wildlife In Eden Valley

By Louis M. Moos

IMPROVED irrigation and the use of other soil and water conservation measures on the farmlands of Eden Valley, Wyo., have turned the valley into a veritable "Eden" for wildlife. It has become a paradise, too, for sportsmen.

Not long ago the situation was different. Irrigation was practiced, but not too successfully. The water supply was not reliable, and too often the canals and ditches were dry. Without reliable water and the food and cover which water makes possible, use of the valley by many birds and animals as a home was almost out of the question.

The present irrigation development is a joint project of the Bureau of Reclamation and the Soil Conservation Service. This has meant much more efficient use of available water. The result, in an area surrounded by sagebrush, has been a greatly improved home for wildlife, with food, cover, and water in new abundance.

The Valley now is known as the best sage grouse hunting area in Wyoming. Mourning doves nest in considerable numbers in the irrigated area. Antelope find the project area a desirable habitat.

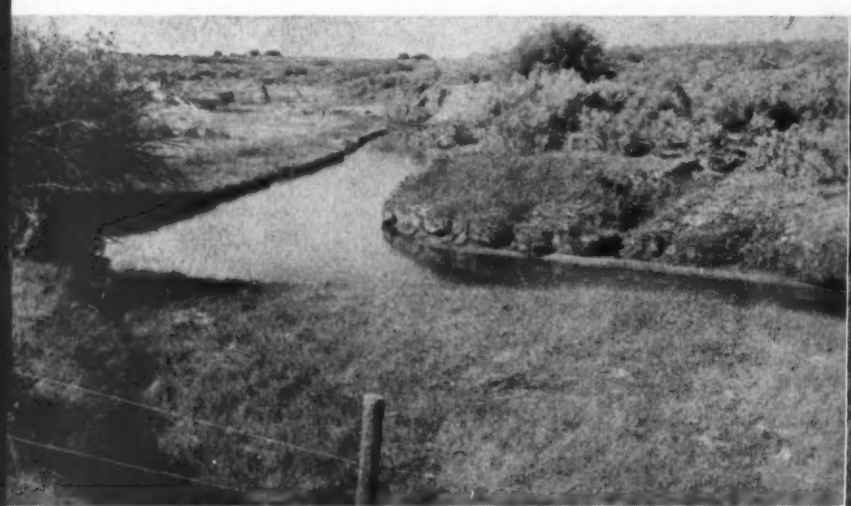
The storage reservoir, which is stocked with Rainbow and Brown trout by the Wyoming Game and Fish Commission, is an excellent place to fish. Ducks and geese find the reservoir an ideal place to rest on their journeys. The water plants that grow in drainage ditches are food for waterfowl, muskrats, and other water-loving species.

Small marsh areas and natural seeps resulting from irrigation are breeding places for water-loving birds and animals. Mallards, teal and shovellers are common residents. Ditches and the other water areas provide shooting places for waterfowl during the hunting season.

The creek that usually went dry for many years now has year-round flow. This flow is partly the result of recharge of water from conservation croplands.

Windbreaks planted by conservation farmers

Note:—The author is biologist, Soil Conservation Service, Billings, Mont.



protect farmsteads and livestock and provide food and cover for wildlife. These plantings add variety to the native woody plants found in the valley. Formerly limited to willow and cottonwood, the valley now has caragana, boxelder, ash, Russian olive, conifers, and ornamental species. Woody plantings attract song and insectivorous birds not found in the adjacent areas.

The hay and grain fields, not there before, provide abundant food and cover. Some farmers leave a small area of crop unharvested for the benefit of the birdlife. The conservation-treated fields make it possible for pheasants to live in the valley. The pheasant population, while not large, was enough to warrant an open hunting season in 1958. The surrounding areas have no pheasants.

Folks living in Eden Valley voice pride in the changes they have made with the use of improved irrigation and farming based on sound land use principles. Their "home improvement plan" for wildlife tenants is one of the things they talk about when discussing the things the Eden Valley irrigation project has made possible.

Pictures (from lower left to upper right): Little Sandy Creek, charged with water from irrigated croplands, provides year-round flow; marsh area, developed from seeps, provides a home for muskrats and waterfowl; grain fields and shelterbelts provide food and cover for wildlife; Russian-olive and caragana planting on Eden Valley farm; Hunters reap a sage hen harvest in Eden Valley.

NEW WATER CONSERVATION RESEARCH LABORATORY

for the Arid Southwest

By Lloyd E. Myers

THE new USDA Southwest Water Conservation Laboratory near Tempe, Ariz., was dedicated in October 1959. The new laboratory has been established to work on critical agricultural water conservation problems in the arid regions of Arizona, Nevada, New Mexico, and Utah. Most of the research will apply to problems on the more than 4 million acres of irrigated land in these States. Many of the research findings will apply, however, to problems in other States. Research will be aimed at discovering new facts about agricultural water use with the objective of using available water supplies more effectively and efficiently.

Note:—The author is director, Southwest Water Conservation Laboratory, Agricultural Research Service, Tempe, Ariz.

Planning of the overall research program is being done in consultation with State Agricultural Experiment Stations and the Soil Conservation Service in the four-State area. Actual research projects will be carried out in cooperation with experiment stations, the SCS, and other interested agencies, groups, and individuals. The Laboratory is situated on five acres of land donated by the University of Arizona.

Although the Laboratory buildings have been occupied for only a few weeks, research projects are already underway. This was made possible by a special Congressional appropriation which permitted two senior staff members to

Main building of the Southwest Water Conservation Laboratory near Tempe, Ariz.

be assigned to the Laboratory in September 1958. Funds for some major equipment purchases also were made available. As a result, problems in the construction of specialized research facilities were ironed out and some of the necessary equipment was available as soon as building construction was completed.

Irrigation water supply problems are increasing steadily in the arid Southwest. Falling water tables, reduction of surface water supplies by droughts, and appropriation of agricultural supplies by municipalities are creating potentially disastrous problems for many irrigated areas. Efforts to develop new water supplies cannot alone solve these problems. Methods of increasing water use efficiency must be developed. Present overall irrigation efficiency is considerably less than 50 percent.

At the present time at least 25 percent of the water diverted or pumped for irrigation is lost by seepage from canals and ditches. Many farm irrigation systems were designed by trial-and-error methods and are very inefficient. Practical, low-cost methods of water measurement are not available with the result that water is not adequately measured on approximately 70 percent of the irrigated land. Reliable and accurate methods are not available for scheduling irrigation times and quantities.

The net result is that in the four States of Arizona, Nevada, New Mexico, and Utah, approximately 4 million acre-feet of water is lost annually in the process of conveying and applying water to the irrigated fields. Some of this water is reclaimed from drainage ditches or by pumping from water tables into which it has seeped. There is little doubt, however, that at least an additional 2 million acre-feet of water would be available for use in these States by increasing irrigation efficiency. The same situation exists, to a greater or lesser degree, in all western irrigated areas.

Research work aimed at increasing irrigation efficiency is underway at the Laboratory. A major effort is being made to develop practical methods for using weather data to accurately determine crop water requirements on a short-term basis so that efficient irrigation schedules and quantities can be calculated easily. The effect of soil and water management practices on the use of water by crops will be studied to see if management practices can be developed to reduce crop water requirements.

Research engineer observes a low-cost raft used for applying hexadecanol to ponds to reduce evaporation loss.

Work to develop low-cost, practical, and accurate methods of measuring water in farm irrigation systems has been started. Research on the reduction of seepage losses, improvement of infiltration rates of irrigated soils, and the design of efficient farm irrigation systems will be started when additional research workers report for duty. Other research projects are being planned with cooperating agencies to fit problem needs and research resources.

Two-thirds of the stockwater ponds constructed in Nevada have never held water because of porous soils which soaked up all rainfall or let collected water seep out rapidly. This problem exists throughout the arid Southwest where inadequate stockwater supplies prevent full utilization of vast areas of rangeland. The Laboratory has work underway to develop low-cost and effective means of increasing rainfall runoff into ponds and reducing seepage and evaporation losses from them.

No. 52

This is the fifty-second of a series of articles to appear from time to time in explanation of the various phases of research being conducted by the Department of Agriculture on problems of soil and water conservation.

Research facilities at the Laboratory have been designed specifically for work on water conservation problems. Special installations include a controlled climate laboratory, radioisotope laboratories, two hydraulic and soil mechanics installations, three controlled temperature laboratories, and an electronic instruments laboratory. The most unusual installation is a set of three electronic weighing lysimeters which are so accurate they can detect a weight change of two ounces in a tank of soil weighing seven thousand pounds. These lysimeters will be used to study the relationships between climate factors and the use of water by crops. Physics, chemistry, and service laboratories; storage sheds; an air-conditioned greenhouse; a machine shop; and adequate office space are also available. These facilities will allow the use of the latest research methods to solve water conservation problems.

Research equipment will include nuclear radiation devices, radioactive tracers, electrical analogs or models, strain gage instrumentation, precise hydraulic apparatus, automatic data-recording devices, and automatic computers for analyzing data. These research devices will be used in the laboratory and in the field to obtain answers it has not been possible to get heretofore.

At present, the Laboratory has 6 professional engineers and scientists and 11 sub-professional supporting staff members. When fully staffed, the Laboratory will have 20 research scientists and engineers and about 30 supporting sub-professional workers.

Using snow survey forecasts for

Water Planning on Irrigated Farms

By Jack N. Washichek

IT is important that an irrigation farmer know—before planting time—just how much irrigation water he can depend on. Fortunately, it is possible for most irrigation farmers of the West to know approximately how much water they will have. For several years forecasts of irrigation season flow have been available for streams that depend largely on snowmelt. The water supply forecasting system of the Soil Conservation Service and cooperating agencies furnishes this information as a result of winter and early spring snow surveys. And wise farmers make use of such information in planning their farming operations; they call it water planning.

Of course, an individual farmer has other things besides stream flow to consider in planning his season's operations. How good are his water rights to the stream flow he depends on, especially during years of short supply? Can he purchase additional water? Does he have a supplemental supply of ground water that he can pump? Can he depend on seasonal rainfall for part of his needs?

These questions and others must be answered in fitting water supply to crops. But an enterprising farmer usually can find the answers and make reasonably accurate estimates as to his total water supply before planting time.

Take the case of Lynnden Fletcher, a cooperator with the West Greeley Soil Conservation District, as an example. One of the farms Mr. Fletcher operates, near Ault, Colo., has 133 acres of cropland. He raises wheat, corn, beans, sugar beets, and alfalfa in conservation rotation on this farm.

Some of these crops need more water than others. According to available research, alfalfa and sugar beets need about 24 inches of water during the growing season. Corn and beans produce well with around 20 inches of water. Wheat requires only 15 inches.

Note:—The author is snow survey supervisor, Soil Conservation Service, Fort Collins, Colo.

The average seasonal rainfall on Fletcher's farm is about 7 inches. This varies from year to year, of course. Nevertheless, Fletcher must use this figure in his water planning; that is, until long-range weather forecasting becomes more reliable than it is at present.

Fletcher gets his surface irrigation water from a local cooperative water supply and storage company that operates the largest ditch diverting water from the Cache la Poudre River. The company also owns a collection system that diverts some water from the headwaters of the Colorado and North Platte rivers. And recently this company has been receiving some water from the Big Thompson River by means of a newly developed diversion. Nevertheless, the records show that the seasonal water supply of this company is closely related to the flow of the Cache la Poudre.

Fletcher has 1-¾ shares in this water supply company. On the average, this company has recently been furnishing its shareholders about 105 acre-feet of water per share. The annual allotment depends, of course, on how much water the company is able to divert and collect under its water rights. If streamflow in the Cache la Poudre is above or below normal, then the water supply of the company is nearly always above or below normal by approximately the same amount, and each shareholder gets his proportionate amount of the available water.

Lynnden Fletcher in one of his alfalfa fields.

Errors in streamflow forecasts may occur because of unexpected weather fluctuations. But the records show that the flow of the Cache la Poudre has been within 10 percent of the forecast from snow surveys during 8 of the past 10 years. In those 10 years the streamflow varied from about 40 percent to 135 percent of normal.

In addition to his surface water supply, Fletcher has a well and pump that will supply him about 1.4 acre-feet of water in 24 hours. This well is used, however, only to supplement

A general view of the Fletcher farm shows the principal source of irrigation water on the snow-capped peaks in the background.

Corn harvest on the Fletcher farm.

surface flow because the well flow alone is not adequate for efficient irrigation. The company's practice has been to deliver surface water to each of its shareholders about 75 days during the irrigation season. Hence, Fletcher can depend on his well to supply about 1.4 x 75, or around 105 acre-feet of water each season.

After considering all of these variables in water supply, Fletcher comes out with a reasonably accurate estimate as to how much water he is going to have for his crops. The way he figures it is this: First he subtracts the expected rainfall of 7 inches from the water requirements of a crop and determines how much irrigation water he will need for each kind of crop. For alfalfa or sugar beets this adds up to 24 minus 7, or 17 inches. For corn or beans it comes out 20 minus 7, or 13 inches. For wheat it is only 8 inches of irrigation water needed for a good crop.

Then Fletcher estimates how much irrigation water he will actually have for the season. During a normal year he can expect 105 times 1.75 (the average water per share times the number of shares owned), or about 184 acre-feet from the ditch company. He adds the 105 acre-feet he can get from his well and comes up with the figure of 289 acre-feet. But ditch loss, deep percolation, evaporation, and runoff waste will normally consume about 40 percent of the total.

This leaves about 173 acre-feet available for crops during an average year. Evenly divided, this means about 1.3 acre-feet or 15.6 inches of water for each of the 133 acres of the farm. This is enough water to give an ample supply for corn and beans on about half the farm with alfalfa or sugar beets on the remainder. Or, he might increase his acreage of alfalfa or beets by planting some wheat.

But, what if the water forecast by the snow surveyors shows that the Cache la Poudre streamflow is going to be only 60 percent of normal? This will mean that Fletcher can expect only 110 acre-feet of water from the ditch company and that his total irrigation supply available for crops will be reduced from 173 to about 128 acre-feet. This is less than 12 inches per acre, and calls for some drastic changes in crop planting plans. Supposing he has 30 acres of alfalfa that he wishes to maintain; then he must plant most of the remaining acreage to small grains if he expects to have adequate water. If he thinks that he should plant some corn, beans, and sugar beets, then he should leave a part of the cropland fallow. He takes market prices, labor costs, and other factors into consideration in making these decisions. But seldom does a wise and experienced farmer like Fletcher go ahead with plans to plant large acreages of water-loving crops and then see them wither and fail for lack of water during critical growing periods.

On the other hand, when the forecast predicts above-normal streamflow Fletcher plans for an increased acreage of the high water users, which are usually the biggest money makers. In other words, this shrewd farmer makes use of the water supply forecasts to increase his profits during the good years and cut his losses during bad years. He calls it water planning for conservation farming.

Farmers who must depend almost wholly on surface water supply for their irrigation needs can make even more profitable use of streamflow forecasts. The present techniques of snow surveying and water supply forecasting are sufficiently accurate to eliminate most of the guesswork about water supply when it comes time to decide on what kind and how much of the various crops to plant. Water planning, of the type done by Lynnden Fletcher, might well be included as an integral part of all conservation plans for irrigated farms that depend mainly on mountain snowmelt.

DISTRICT PROFILE

J. P. SHEDD of GEORGIA

TWENTY-TWO years ago, the chairman of the Committee on Conservation in the Georgia Senate arose to make a speech.

"Gentlemen," he began, "It is my privilege at this time to report the Committee action on the most important piece of legislation that will come before the Senate during the 1937 session of the legislature."

The speaker was the Honorable J. P. Shedd, senator from the third senatorial district. The legislation he referred to was the Georgia soil conservation districts law.

Mr. Shedd continued, "The bill that I am going to ask you to consider is an act to declare the necessity of creating governmental subdivisions of the State, to engage in conserving soil resources and preventing and controlling soil erosion."

Mr. Shedd was all primed to "give 'em both barrels" but that's as far as he got. A senator spoke up and said, "Go ahead and put your question, Shedd. You know that everyone is for soil conservation."

The senator wasn't to be put off that easily, but every time he started to resume his prepared speech someone called for the question. And the law was soon passed.

"I never did get to make that speech," Mr. Shedd recalls plaintively.

However, during the intervening years Mr. Shedd has given his speech many times. I listened to it recently as I sat in his living room in Bleckley County and I can attest to its being a fine speech.

Mr. Shedd delights in pointing out that although he didn't get to deliver his complete speech in favor of the districts law, he did talk long enough to make one forecast that is being proved accurate. That was that the rivers in Georgia would run clear again if legislation was passed enabling farmers to cooperate with legalized districts to control erosion.

In 1937 the Econee, the Ocmulgee, the Chattahoochee, the Flint, and the other rivers in the State had not run clear for a generation or more; but, said Mr. Shedd, ". . . enact this law and our rivers will run clear again."

Today, Georgia's rivers have cleared up substantially and are getting clearer all the time. Actual tests up at the Macon waterworks show that the Ocmulgee carries 75 percent less silt than it did in 1937. This is due almost entirely to the shift from row crops to pastures, to the planting of trees, and to better all-around use of the land in the watershed of the Ocmulgee.

"Not only is there less mud," says Mr. Shedd, "there are fish in the Ocmulgee again. At one time all you could hope to catch was a carp or mudcat, or some other rough fish. Now game fish can again be caught in the Ocmulgee."

Mr. Shedd is especially proud of the work that has been accomplished in the Central Georgia Soil Conservation District, of which he is a supervisor. "Not only have yields substantially increased, but the general appearance of the farms is better," he boasts. "You can ride along any road in Bleckley County and see some of the best land and cattle in Georgia. You can see farm after farm where soil and water used to run off in a soupy mixture when it rained, where it now walks off over a carpet of grass. That's why we've got fish in our rivers again."

Mr. Shedd is not farming actively any longer

J. P. Shedd talks about soil conservation to visitors in his home.

because of declining health, but he still lives on the 1,700-acre farm he bought in 1947. Today most of the farm is in trees, a "crop" in which Mr. Shedd is terrifically interested.

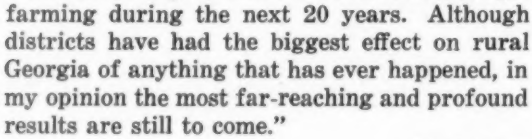
"I bought this farm for $25,000," he says, "since it was mostly cutover land. In the 12 years I've lived here I have sold $80,000 worth of timber and woodland products, and if I cut it back to the shape it was in when I bought it I could sell $25,000 more. And, I wouldn't take a quarter of a million dollars cash for the farm.

"I've got money invested in common stocks and bonds, but in my opinion trees are a much better investment. You can't show me many stocks that would have paid $100,000 in dividends in 12 years and at the same time appreciated from $25,000 to $250,000!"

Mr. Shedd is now 83 years of age and lives in retirement except for his church and his district work. He attends all district meetings, including the annual State meeting, and he speaks regularly before civic clubs, schools, and other groups. He is still as sold on soil conservation as he was when he made his first speech for it 22 years ago.

"Districts have put something into farming that was never there before," Mr. Shedd says. "I am proud that I helped to get district legislation passed. I am proud to have been a part of the district movement for 22 years, and I only regret that I won't be around to witness the tremendous impact that it will have on Georgia farming during the next 20 years. Although districts have had the biggest effect on rural Georgia of anything that has ever happened, in my opinion the most far-reaching and profound results are still to come."

—L. J. SISK



HYDROLOGY. By C. O. Wisler and E. F. Brater. 408 pp. Illus. Second edition. 1959. John Wiley and Sons, Inc: New York.

TEN years of classroom use of this textbook have given the authors the experience and information to revise their book. Two new chapters have also been added. Chapter 9 on semiarid regions mainly concerns California, but it will be useful in other mountain-dryland areas. Chapter 10 on snow will be of interest even to the man who does no more with snow than shovel it out of his driveway.

The fundamentals of hydrology are well explained early in the book. The infiltration and unit hydrograph theories are used as basic tools. Working methods are given for use with rainfall, soil moisture, ground water, runoff, and stream gaging. Water losses are given a separate chapter, where the differing viewpoints of agriculturists and downstream river engineers are fairly treated.

The effects of soils and vegetation on runoff are given more emphasis than usually found in hydrology textbooks. For engineers, the authors show a generous appreciation of land use and treatment measures, even going so far as to say (page 342) that "... if properly designed they (terraces) are effective in flood reduction and as a soil conservation measure." Dams and small reservoirs receive adequate, if less kindly, treatment.

Conservationists will find this book worth owning. Its use as a classroom text should not be taken as a sign of a dry-as-dust approach. While the book is technically sound, it is very readable. The authors have taken the trouble to explain clearly the more foggy notions of hydrology, a science that could not exist without its graphs and equations.

—VICTOR MOCKUS

MANAGING FARM FIELDS, WETLANDS, AND WATERS FOR WILD DUCKS IN THE SOUTH. By Verne E. Davison and William W. Neely. 16 pp. Illus. 1959. Farmers' Bulletin No. 2144, U.S. Department of Agriculture: Washington.

Helping farmers in the South attract more wild ducks to agricultural land by "farming for waterfowl" is the theme of this new Farmers' Bulletin. The authors emphasize that the key to attracting and keeping wild ducks on a farm is to supply them with food that they like, as well as giving them some open water. The publication describes how farmers can manage food plants, water levels, and other conditions to attract ducks and keep them during the winter months. It also has some pointers for duck hunters.

Mountain Meadow Improvement

Mushrooms in Elko County

By L. T. Turner

CATTLEMEN Russel S. Weeks, Kenneth Johns, and their neighbors in the Clover Soil Conservation District near Wells, Nevada, have developed efficient techniques for breaking out native meadows and establishing high-producing hay fields and pastures.

Native meadows have significant disadvantages, including low forage yields and poor feeding qualities. They also have extravagant water requirements and skimpy root systems which use only 1 foot of the soil profile for plant feeding. The continuous irrigation necessary for native meadows also wastes plant nutrients through leaching.

The phrase "wearing out sod" aptly describes many meadow-breaking jobs. In some cases the job has almost worn out the rancher before the land was in good enough condition to seed to grain.

Kenny Johns puts it this way: "My native meadows have a heavy sod developed through years of keeping the land wet by wild flood irrigation. Breaking meadows for reseeding is a hard job; but my improved seedings have quadrupled production, so each year I am plowing up the K. C. Ranch native meadows as fast as I can."

There is usually a nitrogen deficiency resulting from the large amount of organic matter in freshly plowed meadow sod. Hence, Johns and Weeks apply nitrogen fertilizer before plowing to hasten sod decomposition. Johns says: "I apply 33 pounds of available nitrogen per acre as a top dressing before plowing. A year after breaking, little or no sod remains."

Rancher Johns uses an ordinary two-way 18-inch moldboard plow to break meadows. He chooses a time in the spring when the soil moisture is just right for good soil tilth. He cautions that for a good job the plowshares must be sharp. In fine sandy loam soils he changes shares daily, and in coarse and fine gravelly loam, twice a day. Johns adjusts his plow carefully to cut uniform-width furrow slices. A coulter wheel aids in cutting the sod cleanly.

"I have found from experience," Johns declares, "that if my plow is working properly and soil moisture is right, I can turn the furrow slices over to expose two or more inches of soil and leave little or no grass exposed to light."

Plowing depth is important. Johns attempts to plow just deep enough to turn up sufficient soil for a grain seedbed—about 2 to 4 inches. If the plowing is too shallow there is not enough soil on top to cover the grass, while plowing too deep slows the rate of sod decomposition by burying it too deep for adequate air and soil warmth. Deep plowing also raises costs by re-

Moldboard plows work well in turning under sod in the spring when soil moisture is right.

Note:—The author is work unit conservationist, Soil Conservation Service, Wells, Nev.

Kenneth Johns inspects a grain seedbed prepared by plowing, harrowing with a disk harrow, and dragging.

quiring more power and causing heavy wear on equipment.

Johns stops after plowing 3 to 5 acres and works the land with a disk harrow and lumber drag. This prevents undue soil drying. The soil moisture available then assists the harrowing and dragging operations to pack the sod tightly against the plow sole and so spread the soil uniformly on the surface.

Disk plows are best for breaking up sod in the fall when the soil is dry.

"When I wait a week or more after plowing, I have found that meadow grasses will take root and grow at the junction of the furrows. To prevent this, I plow in the morning and disk harrow in the afternoon."

Johns completes his grain seedbed preparation by disking and dragging twice, both with and across the furrows.

Many Elko County meadows too wet for spring plowing are bone dry after haying in the fall. Plowing at this time must be done with disk plows since the land is far too dry for moldboards. Russel Weeks gets good results with a 28-inch disk plow set to cut 10 inches deep.

Russel says: "Before plowing, I chisel my old meadows with the teeth set 2 feet apart and digging 12 inches deep. I then plow at right angles to the chisel marks; this helps the disk plow to tear up old meadows."

In the spring, Weeks replows disked meadows with a disk plow and works the land with a disk harrow and drag to form a satisfactory grain seedbed. He says: "On the second plowing operaion better results are obtained by working at right angles to the first plowing."

It is usually necessary to grow two grain crops to thoroughly kill the meadow sod. Many

ranchers level their meadows after the first grain crop. Leveling equipment works much easier after the sod is decomposed, and there is less settling in the fills. In applying water to the second grain crop any uneveness in leveling can be located and can usually be corrected with a landplane.

Weeks sprays his grain with herbicides to control the bothersome native weeds that often persist and cause trouble in new alfalfa and grass seedings.

Another essential to success in meadow improvement is water control. In furthering this program, SCS technicians in 1958 surveyed 18.3 miles of irrigation ditches in the four soil conservation districts served by the Wells office.

Service engineers in 1958 staked 1,300 acres on 20 ranches for leveling to planned grades. This is the largest amount leveled on soil conservation district cooperators' lands in 13 years of SCS activity in Elko County.

Conservation ranchers Weeks and Johns know that water application, according to the needs of plants, is highly important. Water-loving native plants have their roots practically on the surface, or no deeper than a foot, and require almost continuous irrigation. Deep-rooted alfalfa and grasses on moderate to deep loam soils require irrigation only every 20 to 30 days. Good soil drainage must be provided to maintain high production of the better quality grasses and legumes.

For permanent hay, Weeks likes Ranger alfalfa and intermediate wheatgrass for his better drained lands, and on slightly wet land, alfalfa, alsike clover, Reed canarygrass, and smooth brome.

Johns has had good results with Taulatin tall oatgrass, Ranger alfalfa, and Manchar smooth bromegrass.

This type of meadow improvement involves fertilization, breaking out native sod, seeding grain, irrigation system improvement, land smoothing or leveling, and plenty of hard work. The program is now rolling in high gear in Elko County.

Weeks, Johns, and many other Elko County ranchers have reported yields from well-managed improved meadows to vary from 2.5 to 6 tons per acre with averages of 3.5 tons. For

Ranchers visit an improved mountain meadow during a soil conservation tour in the Clover Soil Conservation District.

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Elko County's 154,000 acres of native meadow, which now produce about a ton per acre, a phenomenal potential increase is indicated.

In full production, the improved meadows will yield an estimated 539,000 tons of hay as compared to a present production of 154,000 tons. The increased hay would feed about 336,000 beef cows for the 4-month winter feeding period as compared to today's 96,000 head.

New Sedimentation Laboratory

A new sedimentation research laboratory of the Agricultural Research Service was dedicated at Oxford, Miss., in November 1959. The laboratory's main job will be research on sediment movement in streams. Among other equipment is an adjustable flume 100 feet long, 4 feet wide, and 2 feet deep that can duplicate the velocity and carrying capacity of water in streams common to the area. The ARS scientists hope that a correlation between field and laboratory measurements at this station will lead to the discovery of laws that will explain the transporting and deposition of sediment by streams.

◆

The fifth World Forestry Congress is to be held on the campus of the University of Washington, Seattle, Wash., August 29 to September 10, 1960. The United States Government is the host to the Congress. The Food and Agriculture Organization of the United Nations and other agencies are cooperating.

◆

A bank in Hancock, Md., is conducting a year-long planting contest for the landowners in its area who plant the most trees. The top prize will be $125. The smallest area eligible is 5 acres.

A total of 660 incentive awards amounting to $87,700.62 in cash was given SCS employees during fiscal year 1959. The Service paid employees $6,704.97 for 152 work-improvement suggestions, which resulted in estimated savings of $98,206. It rewarded 60 special acts or services with cash payments of $3,967, which resulted in estimated savings of $77,020. Sustained superior performance awards totaling $77,028.65 were given to 448 employees.

◆

During fiscal year 1959, the SCS automotive fleet of 11,078 passenger cars and light trucks traveled more than 102 million miles at an average cost of 5.27 cents per mile, including overhead and depreciation.

"FARMERS WHO FOLLOW SOIL CONSERVATION PRACTICES ARE 'ON THE BEAM'."

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